WE CLAIM:

1. A method for encoding an error correcting code for providing an error correcting code to a client signal having a fixed bit rate, said method comprising the steps of:

repeatedly parallellizing said client signal to B systems every A bits to generate B parallellized client signals;

segmenting said B parallellized client signals every C bits to create B parallellized client blocks;

increasing a bit rate of each of said B parallellized client blocks by a factor of D to increase a length of each said parallellized client block from C bits to E bits to create B outer code subblocks;

placing information of said parallellized client blocks in a second bit to a (C+1)th bit in each of said B outer code subblocks on a time series basis, leaving a first bit and a (C+2)th bit to an E-th bit as an empty area created by increasing the bit rate, assigning a first bit of said empty area as an overhead area, and an area from a (C+2)th bit to the E-th bit of said empty area as a check bit area for an outer code; and

encoding each of said B outer code subblocks independently with an outer code Λ, and placing check bits thereof in said check bit area for the outer code

to create B outer encoded subblocks.

2. A method for encoding an error correcting code according to claim 1, further comprising the steps of:

adding F empty blocks to said B outer encoded subblocks, said empty block having the same length as said outer encoded subblock, to create a total of G intermediate subblocks;

assigning an area of said F empty blocks as a check bit area for an inner code;

segmenting each of said G intermediate subblocks every H bits, and collecting an amount of the segmented H bits corresponding to said G intermediate subblocks to create one inner code subblock;

segmenting again said G intermediate subblocks into J of said inner code subblocks;

encoding each of said J inner code subblocks independently with an inner code Ψ, placing check bits thereof in said check bit area for the inner code to create J inner encoded subblocks;

inserting a framing pattern indicative of starting positions of said outer encoded subblocks and said inner coded subblocks, and a plurality of information for OAM&P of a network into said overhead area;

regarding said J inner encoded subblocks as a single inner encoded block;

performing predetermined scrambling on said inner encoded block to create a scrambled inner coded

block; and

interleaving every L consecutive bits from each of G parallel signals in said scrambled inner encoded block to generate a single serial super FEC signal having a bit rate (D×G/B) times as high as that of said client signal,

wherein said A, B, C, E, F, G, H, J, L are predetermined integer values, and said D is a predetermined value.

3. A method for encoding an error coding code according to claim 1, further comprising the steps of:

increasing a bit rate of each of said B outer encoded subblocks by a factor of R to create B intermediate subblocks;

allocating an empty area comprised of Q consecutive bits created by increasing the bit rate in every P consecutive bits of an inner code information area in each of said B intermediate subblocks, placing information of said outer encoded subblocks in said inner code information area, and assigning said Q bits of the empty area as a check bit area for an inner code;

segmenting each of said B intermediate subblocks every (P+Q) bits corresponding to said inner code information area and said check bit area for the inner code, collecting a number of segmented (P+Q) bits corresponding to said B intermediate subblocks to create a single inner code subblock;

segmenting again said B intermediate subblocks into J of said inner code subblocks;

encoding each of said J inner code subblocks independently with an inner code Ψ, placing check bits thereof in said check bit area for the inner code to create J inner encoded subblocks;

inserting a framing pattern indicative of starting positions of said outer encoded subblocks and said inner coded subblocks, and a plurality of information for OAM&P of a network into said overhead area;

regarding said J inner encoded subblock as a single inner encoded block;

performing predetermined scrambling on said inner encoded block to create a scrambled inner coded block; and

interleaving every L consecutive bits from each of G parallel signals in said scrambled inner encoded block to generate a single serial super FEC signal having a bit rate $(D \times R)$ times as high as that of said client signal,

wherein said A, B, C, E, J, L, P, Q are predetermined integer values, and said D and R are predetermined values.

4. A method for decoding a super FEC signal while correcting errors in said super FEC signal, said super FEC signal having a predetermined frame structure, a predetermined overhead area, and a predeter-

mined error correcting code, said method comprising the steps of:

repeatedly parallellizing said super FEC signal to G systems every L consecutive bits to generate G parallellized FEC signals;

detecting a framing pattern inserted in said overhead area to adjust a temporal sequence and a parallel sequence of said parallellized FEC signal to reconstruct a sequence of a scrambled inner encoded block; and

performing predetermined descrambling on said scrambled inner encoded block to reconstruct an inner encoded block.

5. A decoding method according to claim 4, further comprising the steps of:

extracting a plurality of information pieces for OAM&P of a network inserted at predetermined positions in said overhead area to perform predetermined processing;

segmenting every H consecutive bits in each of parallel signals from said inner encoded block to reconstruct J inner encoded subblocks;

decoding each of said J inner encoded subblocks independently with an inner code Ψ to create J inner decoded subblocks;

reconstructing G parallellized intermediate subblocks from said J inner decoded subblocks;

restoring B outer encoded subblocks from said

G intermediate subblocks;

decoding each of said B outer subblocks independently with an outer code Λ to create B outer decoded subblocks;

reducing a bit rate of each of said B outer decoded subblocks by a factor of D to reduce a length of each said outer decoded subblock from E bits to C bits, removing an overhead area and a check bit area for the outer code, and leaving information from a second bit to a (C+1)th bit in time series to reconstruct B parallellized client blocks; and

interleaving every A consecutive bits from each of said B parallellized client blocks to restore a single serial client signal having a bit rate (B/D/G) times as high as that of said super FEC signal,

wherein each of said A, B, C, D, E, G, H, J, L is a predetermined value, and said inner code Ψ and said outer code Λ are predetermined codes.

6. A decoding method according to claim 4, further comprising the steps of:

extracting a plurality of information pieces for OAM&P of a network inserted at predetermined positions in the overhead area of said inner encoded block to perform predetermined processing;

segmenting every (P+Q) consecutive bits in each of parallel signals from said inner encoded block to reconstruct J inner encoded subblocks;

decoding each of said J inner encoded sub-

blocks independently with an inner code Ψ to create J inner decoded subblocks;

reconstructing B parallellized intermediate subblocks from said J inner decoded subblocks;

reducing a bit rate of each of said B intermediate subblocks by a factor of R, removing a check bit area for an inner code in each of said B intermediate subblocks, and leaving the remainder to reconstruct B outer encoded subblocks;

decoding each of said B outer subblocks independently with an outer code Λ to create B outer decoded subblocks;

reducing a bit rate of each of said B outer decoded subblocks by a factor of D to reduce a length of each said outer decoded subblock from E bits to C bits, removing an overhead area and a check bit area for the outer code, and leaving information from a second bit to a (C+1)th bit in time series to reconstruct B parallellized client blocks; and

interleaving every A consecutive bits from each of said B parallellized client blocks to restore a single serial client signal having a bit rate (B/D/G) times as high as that of said super FEC signal,

wherein each of said A, B, C, D, E, H, J, L, P, Q, R is a predetermined value, and said inner code Ψ and said outer code Λ are predetermined codes.

7. A method for encoding an error correcting code according to claim 1, wherein:

said A is set to 1; said B is set to 128; said C is set to 238; said D is set to 15/14; said E is set to 255; said F is set to 16; said G is set to 144; said H is set to 1; said J is set to 255; and said L is set to 1;

said outer code Λ comprises either an eight-error-correcting Reed-Solomon code on Galois field, or an eleven-error-correcting shortened BCH code based on Galois field; and

said inner code Ψ comprises either a single-error-correcting shortened Reed-Solomon code on Galois field, or a double-error-correcting shortened BCH code based on Galois field.

8. A decoding method according to claim 4, wherein:

said A is set to 1; said B is set to 128; said C is set to 238; said D is set to 15/14; said E is set to 255; said F is set to 16; said G is set to 144; said H is set to 1; said J is set to 255; and said L is set to 1;

said outer code Λ comprises either an eight-error-correcting Reed-Solomon code on Galois field, or an eleven-error-correcting shortened BCH code based on Galois field; and

said inner code Ψ comprises either a single-error-correcting shortened Reed-Solomon code on Galois field, or a double-error-correcting shortened BCH code based on Galois field.

9. A method for encoding an error correcting code according to claim 1, wherein:

said A is set to 1; said B is set to 112; said C is set to 238; said D is set to 15/14; said E is set to 255; said F is set to 16; said G is set to 128; said H is set to 1; said J is set to 255; and said L is set to 1;

said outer code Λ comprises either an eight-error-correcting Reed-Solomon code on Galois field, or an eleven-error-correcting shortened BCH code based on Galois field; and

said inner code Ψ comprises either a single-error-correcting shortened Reed-Solomon code on Galois field, or a double-error-correcting shortened BCH code based on Galois field.

10. A decoding method according to claim 4, wherein:

said A is set to 1; said B is set to 112; said C is set to 238; said D is set to 15/14; said E is set to 255; said F is set to 16; said G is set to 128; said H is set to 1; said J is set to 255; and said L is set to 1;

said outer code Λ comprises either an eight-error-correcting Reed-Solomon code on Galois field, or an eleven-error-correcting shortened BCH code based on Galois field; and

said inner code Ψ comprises either a single-error-correcting shortened Reed-Solomon code on Galois

field, or a double-error-correcting shortened BCH code based on Galois field.

11. A method for encoding an error correcting code according to claim 3, wherein:

said A is set to 1; said B is set to 128; said C is set to 238; said D is set to 15/14; said E is set to 255; said J is set to 19; said L is set to 1; said P is set to 112; said Q is set to 8; and said R is set to 15/14;

said outer code Λ comprises either an eight-error-correcting Reed-Solomon code on Galois field, or an eleven-error-correcting shortened BCH code based on Galois field; and

said inner code Ψ comprises either an eight-error-correcting shortened Reed-Solomon code on Galois field, or an eleven-error-correcting shortened BCH code based on Galois field.

12. A decoding method according to claim 6, wherein:

said A is set to 1; said B is set to 128; said C is set to 238; said D is set to 15/14; said E is set to 255; said J is set to 19; said L is set to 1; said P is set to 112; said Q is set to 8; and said R is set to 15/14;

said outer code Λ comprises either an eight-error-correcting Reed-Solomon code on Galois field, or an eleven-error-correcting shortened BCH code based on Galois field; and

said inner code Ψ comprises either an eight-error-correcting shortened Reed-Solomon code on Galois field, or an eleven-error-correcting shortened BCH code based on Galois field.

13. A method for encoding an error correcting code according to claim 1, wherein:

a capacity equal to or more than a capacity of said client signal multiplied by {1-(B/D/G)} is an empty area which can be freely used;

a portion or the entirety of said empty area is regarded as the check bit area for the outer code, the check bit area for the inner code, and said over-head area, without converting the bit rates of said client signal and said super FEC signal; and

data of said client signal and said FEC signal are placed at predetermined positions to create said outer code subblock and said inner code subblock, or said outer encoded subblock and said inner encoded subblock.

14. A decoding method according to claim 4, wherein:

a capacity equal to or more than a capacity of said client signal multiplied by {1-(B/D/G)} is an empty area which can be freely used;

a portion or the entirety of said empty area is regarded as the check bit area for the outer code, the check bit area for the inner code, and said over-head area, without converting the bit rates of said

client signal and said super FEC signal; and

data of said client signal and said FEC signal are placed at predetermined positions to create said outer code subblock and said inner code subblock, or said outer encoded subblock and said inner encoded subblock.

15. A method for encoding an error correcting code according to claim 3, wherein:

a capacity equal to or more than a capacity of said client signal multiplied by {1-(1/D/R)} is an empty area which can be freely used;

a portion or the entirety of said empty area is regarded as the check bit area for the outer code, the check bit area for the inner code, and said overhead area, without converting the bit rates of said client signal and said super FEC signal; and

data of said client signal and said FEC signal are placed at predetermined positions to create said outer code subblock and said inner code subblock, or said outer encoded subblock and said inner encoded subblock.

16. A decoding method according to claim 6, wherein:

a capacity equal to or more than a capacity of said client signal multiplied by {1-(1/D/R)} is an empty area which can be freely used;

a portion or the entirety of said empty area is regarded as the check bit area for the outer code,

the check bit area for the inner code, and said overhead area, without converting the bit rates of said client signal and said super FEC signal; and

data of said client signal and said FEC signal are placed at predetermined positions to create said outer code subblock and said inner code subblock, or said outer encoded subblock and said inner encoded subblock.

17. A method for encoding an error correcting code according to claim 1, wherein:

said client signal is converted into said super FEC signal by first encoding each of said J inner code subblocks with said inner code Ψ, and encoding each of said G intermediate subblocks or said B intermediate subblocks with said outer code Λ; and

said super FEC signal is converted into said client signal by first decoding each of said G intermediate subblocks or said B intermediate subblocks with said outer code Λ, and decoding each of said J inner encoded subblocks with said inner code Ψ to exchange the order of said encoding and said decoding with said inner code Ψ and said outer code Λ.

18. A decoding method according to claim 4, wherein:

said client signal is converted into said super FEC signal by first encoding each of said J inner code subblocks with said inner code Ψ, and encoding each of said G intermediate subblocks or said B

intermediate subblocks with said outer code Λ; and

said super FEC signal is converted to said client signal by first decoding each of said G intermediate subblocks or said B intermediate subblocks with said outer code Λ, and decoding each of said J inner encoded subblocks with said inner code Ψ to exchange the order of said encoding and said decoding with said inner code Ψ and said outer code Λ.

19. A method for encoding an error correcting code according to claim 1, wherein:

when said J inner code subblocks are encoded with said inner code Ψ, a check bit of each of said inner code subblocks is placed in a check bit area of an inner code subblock subsequent thereto; and

when said J inner encoded subblocks are decoded with said inner code Ψ, decoding processing is performed on the assumption that a check bit of each of aid inner encoded subblocks is placed in an inner encoded subblock subsequent thereto.

20. A decoding method according to claim 4, wherein:

when said J inner code subblocks are encoded with said inner code Ψ, a check bit of each of said inner code subblocks is placed in a check bit area of an inner code subblock subsequent thereto; and

when said J inner encoded subblocks are decoded with said inner code Ψ, decoding processing is performed on the assumption that a check bit of each of

aid inner encoded subblocks is placed in an inner encoded subblock subsequent thereto.

21. A method for encoding an error correcting code according to claim 1, wherein:

said client signal is any of:

an SDH signal defined in ITU-T Recommendation G.707, and a SONET signal defined in ANSI Recommendation T1.105;

a signal error-correction-encoded using an eight-error-correcting Reed-Solomon code on Galois field defined in ITU-T Recommendation G.975;

a signal on an OCh layer defined in ITU-T Recommendation G.872;

any of 1000 Base-SX, 1000 Base-LX and 1000 Base-CX signals defined in IEEE standard 802.3z; and

a signal generated by time division multiplexing said above signals in an arbitrary manner.

22. A decoding method according to claim 4, wherein:

said client signal is any of:

an SDH signal defined in ITU-T Recommendation G.707, and a SONET signal defined in ANSI Recommendation T1.105;

a signal error-correction-encoded using an eight-error-correcting Reed-Solomon code on Galois field defined in ITU-T Recommendation G.975;

a signal on an OCh layer defined in ITU-T Recommendation G.872;

any of 1000 Base-SX, 1000 Base-LX and 1000 Base-CX signals defined in IEEE standard 802.3z; and

a signal generated by time division multiplexing said above signals in an arbitrary manner.

23. A method for encoding an error correcting code according to claim 1, wherein:

said client signal is a code encoded with the same code Φ as said outer code Λ;

said client signal is converted into said super FEC signal by:

converting a bit rate of said client signal to a predetermined bit rate, and encoding said client signal with said inner code Ψ to generate said super FEC signal; or

once decoding said client signal with said code Φ, converting a bit rate of said client signal to a predetermined bit rate, and encoding said client signal with said inner code Ψ to generate said super FEC signal; or

once decoding said client signal with said code Φ, again encoding said client signal with said outer code Λ, converting a bit rate of said client signal to a predetermined bit rate, and encoding said client signal with said inner code Ψ to generate said super FEC signal; or

converting a bit rate of said client signal to a predetermined bit rate, encoding said client signal with said outer code Λ, and encoding said client

signal with said inner code Ψ to generate said super FEC signal, and

said super FEC signal is converted into said client signal by:

decoding said super FEC signal with said inner code Ψ, and converting a bit rate of said super FEC signal to a predetermined bit rate to generate said client signal; or

decoding said super FEC signal with said inner code Ψ, converting a bit rate of said super FEC signal to a predetermined bit rate, and decoding said super FEC signal with said outer code Λ to generate said client signal; or

decoding said super FEC signal with said inner code Ψ, subsequently converting a bit rate of said super FEC signal to a predetermined bit rate, once decoding said super FEC signal with said outer code Λ, and subsequently assigning said super FEC signal once encoded with said code Φ as said client signal; or

decoding said super FEC signal with said inner code Ψ and said outer code Λ, and converting a bit rate of said super FEC signal to a predetermined bit rate to generate said client signal.

24. A decoding method according to claim 4, wherein:

said client signal is a code encoded with the same code Φ as said outer code Λ;

said client signal is converted into said

super FEC signal by:

converting a bit rate of said client signal to a predetermined bit rate, and encoding said client signal with said inner code Ψ to generate said super FEC signal; or

once decoding said client signal with said code Φ, converting a bit rate of said client signal to a predetermined bit rate, and encoding said client signal with said inner code Ψ to generate said super FEC signal; or

once decoding said client signal with said code Φ, again encoding said client signal with said outer code Λ, converting a bit rate of said client signal to a predetermined bit rate, and encoding said client signal with said inner code Ψ to generate said super FEC signal; or

converting a bit rate of said client signal to a predetermined bit rate, encoding said client signal with said outer code Λ, and encoding said client signal with said inner code Ψ to generate said super FEC signal, and

said super FEC signal is converted into said client signal by:

decoding said super FEC signal with said inner code Ψ, and converting a bit rate of said super FEC signal to a predetermined bit rate to generate said client signal; or

decoding said super FEC signal with said

inner code Ψ, converting a bit rate of said super FEC signal to a predetermined bit rate, and decoding said super FEC signal with said outer code Λ to generate said client signal; or

decoding said super FEC signal with said inner code Ψ, subsequently converting a bit rate of said super FEC signal to a predetermined bit rate, once decoding said super FEC signal with said outer code Λ, and subsequently assigning said super FEC signal once encoded with said code Φ as said client signal; or

decoding said super FEC signal with said inner code Ψ and said outer code Λ, and converting a bit rate of said super FEC signal to a predetermined bit rate to generate said client signal.

25. A method for encoding an error correcting code according to claim 23, wherein:

said A is set to 1; said C is set to 238; and said E is set to 255,

said outer code Λ comprises an eight-error-correcting Reed-Solomon code on Galois field; and

said client signal comprises a signal error-correction-encoded using an eight-error-correcting Reed-Solomon code on Galois field defined in ITU-T Recommendation G.975.

26. A decoding method according to claim 24, wherein:

said A is set to 1; said C is set to 238; and said E is set to 255,

said outer code Λ comprises an eight-error-correcting Reed-Solomon code on Galois field; and

said client signal comprises a signal error-correction-encoded using an eight-error-correcting Reed-Solomon code on Galois field defined in ITU-T Recommendation G.975.

27. A method for encoding an error correcting code according to claim 23, wherein:

when said client signal is converted into said super FEC signal,

inserting information indicating which of said four types of conversions has been performed at a predetermined FSI byte position into said overhead area of said super FEC signal; and

when said super FEC signal is converted into said client signal in an opposite way,

extracting information at a predetermined FSI byte position in said overhead area of said super FEC signal, and determining based on the extracted information which of said four types of conversions is performed.

28. A decoding method according to claim 24, wherein:

when said client signal is converted into said super FEC signal,

inserting information indicating which of said four types of conversions has been performed at a predetermined FSI byte position into said overhead area

of said super FEC signal;

when said super FEC signal is converted into said client signal in an opposite way,

extracting information at a predetermined FSI byte position in said overhead area of said super FEC signal, and determining based on the extracted information which of said four types of conversions is performed.

29. A decoding method according to claim 4, wherein said decoding with the outer code Λ and said decoding with the inner code Ψ are alternately repeated a plurality of times.

30. A method for encoding an error correcting code according to claim 1, wherein:

when said client signal is converted into said super FEC signal,

information indicating whether or not said overhead area was included in the decoding processing involved in the encoding with said outer code Λ and said inner code Ψ is inserted at a predetermined FSIB byte position in said overhead area of said super FEC signal; and

when said super FEC signal is converted into said client signal in an opposite way,

information at a predetermined FSIB byte position in said overhead area of said super FEC signal is extracted to determine based on the extracted information whether or not said overhead is included in the

decoding processing involved in the decoding with said inner code Ψ and said outer code Λ.

31. A decoding method according to claim 4, wherein:

when said client signal is converted into said super FEC signal,

information indicating whether or not said overhead area was included in the processing involved in the encoding with said outer code Λ and said inner code Ψ is inserted at a predetermined FSIB byte position into said overhead area of said super FEC signal; and

when said super FEC signal is converted into said client signal in an opposite way,

information at a predetermined FSIB byte position in said overhead area of said super FEC signal is extracted to determine based on the extracted information whether or not said overhead is included in the processing involved in the decoding with said inner code Ψ and said outer code Λ.

32. A method for encoding an error correcting code according to claim 1, wherein:

when said client signal is converted into said super FEC signal,

inserting information indicating whether or not said client signal was encoded with said outer code Λ and said inner code Ψ at a predetermined FSIC byte position in said overhead area of said super FEC

signal; and

when said super FEC signal is converted into said client signal in an opposite way,

extracting information at a predetermined FSIC byte position in said overhead area of said super FEC signal, and determining based on the extracted information whether or not said super FEC signal is decoded with said inner code Ψ, and whether or not said FEC signal is decoded with said outer code Λ.

33. A decoding method according to claim 4, wherein:

when said client signal is converted into said super FEC signal,

inserting information indicating whether or not said client signal is encoded with said outer code Λ and said inner code Ψ at a predetermined FSIC byte position in said overhead area of said super FEC signal; and

when said super FEC signal is converted into said client signal in an opposite way,

extracting information at a predetermined FSIC byte position in said overhead area of said super FEC signal, and determining based on the extracted information whether or not said super FEC signal is decoded with said inner code Ψ, and whether or not said FEC signal is decoded with said outer code Λ.

34. A method for encoding an error correcting code according to claim 1, wherein:

said super FEC signal is generated by:

regarding, as a single column, (G×R) bits or (B×R) bits comprised of a number of parallel columns of R temporally synchronized consecutive bits in each of said J inner code subblocks;

extracting a total of J columns, one from each of said J inner code subblocks, and arranging said columns successively on a time series basis;

repeatedly performing said rearrangement on all columns in said J inner code subblocks; and

newly encoding said rearranged inner code subblocks with said inner code Ψ as J inner code subblocks, or

extracting a total of J columns, one from each of said J inner encoded subblocks after encoded with said inner code Ψ, and arranging said columns successively on a time series basis;

repeatedly performing said rearrangement on all columns in said J inner code subblocks; and

assigning said rearranged inner code sub-blocks newly as J inner encoded subblocks.

35. A method for encoding an error correcting code according to claim 1, wherein:

said super FEC signal is generated by:

grouping every S outer encoded subblocks from among said B outer encoded subblocks, and shifting groups of said S outer encoded subblocks by a constant time interval from one another to newly generate B

outer encoded subblocks, or

grouping every S parallel signals from among said G or B parallel signals in said inner encoded blocks, and shifting groups of said S parallel signals by a constant time interval from one another to newly generate inner encoded blocks.

36. A method for encoding an error correcting code according to claim 1, wherein:

said Kr is set to one of 16, 32 or 64;

said client signal comprises an OC-192 signal of SONET defined in ANSI Recommendation T1.105, or an STM-64 signal of SDH defined in ITU-T Recommendation G.707; and

said outer code Λ comprises an eight-error-correcting Reed-Solomon code on Galois field.

37. A decoding method according to claim 4, wherein:

said Kr is set to one of 16, 32 or 64;

said client signal comprises an OC-192 signal of SONET defined in ANSI Recommendation T1.105, or an STM-64 signal of SDH defined in ITU-T Recommendation G.707; and

said outer code Λ comprises an eight-error-correcting Reed-Solomon code on Galois field.

38. A method for encoding an error correcting code according to claim 1, wherein said client signal is a signal generated by terminating an 8B10B code of a digital signal encoded using an 8B10B code defined in

IEEE standard 802.3z, and reducing a bit rate thereof in an appropriate ratio with respect to the bit rate before the 8B10B code termination, or a signal generated by terminating the 8B10B code and maintaining a bit rate thereof.

39. A decoding method according to claim 5, wherein said client signal is a signal generated by terminating an 8B10B code of digital signal encoded using an 8B10B code defined in IEEE standard 802.3z, and reducing a bit rate thereof in an appropriate ratio with respect to the bit rate before the 8B10B code termination, or a signal generated by terminating the 8B10B code and maintaining a bit rate thereof.

40. A super FEC signal transmitter for converting a received client signal into a super FEC signal and outputting the super FEC signal, said super FEC signal transmitter comprising:

a serial-to-parallel conversion unit for receiving a digital client signal having a constant bit rate, parallellizing the client signal and outputting the parallellized signal;

a first frame conversion unit for increasing a bit rate of each of signals from said serial-to-parallel conversion unit to a predetermined bit rate, rearranging data into a predetermined frame format, and outputting the rearranged data;

a first overhead insertion unit for inserting a framing pattern and a variety of information for

OAM&P of a network into a predetermined overhead area of a signal from said first frame conversion unit, and outputting the signal having the information inserted therein;

a first encode processor unit for encoding the signal from said first overhead insertion unit using an outer code Λ and outputting the encoded signal;

a second overhead insertion unit for inserting a framing pattern and a variety of information for OAM&P of a network into a predetermined overhead area of the signal from said first encode processor unit, and outputting the signal having the information inserted therein;

a second frame conversion unit for increasing a bit rate of the signal from said second overhead insertion unit to a predetermined bit rate, converting the number of parallellized data of the signal to a predetermined number of parallellized data to rearrange the data into a predetermined frame format, and outputting the rearranged data;

a second encode processor unit for encoding the signal from said second overhead insertion unit with an inner code Ψ and outputting the encoded signal;

a third overhead insertion unit for inserting a framing pattern and a variety of information for OAM&P of a network into a predetermined overhead area of the signal from said second encode processor unit,

and outputting the signal having the information inserted therein;

a scrambler for performing predetermined scrambling on the signal from said third overhead insertion unit and outputting the scrambled signal;

a parallel-to-serial conversion unit for serializing the signal from said scrambler and outputting the serialized signal as a super FEC signal; and

an overhead processor unit for indicating a frame pattern and predetermined information for OAM&P of a network to be inserted to each of said first overhead insertion unit, said second overhead insertion unit and said third overhead insertion unit.

41. A super FEC signal receiver for converting a received super FEC signal into a client signal and outputting the client signal, comprising:

a serial-to-parallel conversion unit for receiving a super FEC signal generated by the super FEC signal transmitter according to claim 40, parallelizing said super FEC signal, and outputting the parallellized super FEC signal;

a frame synchronization unit for detecting a predetermined framing pattern from the signal from said serial-to-parallel conversion unit, rearranging the signal in a proper sequence to organize the signal into a predetermined frame format, and outputting the signal in the predetermined frame format;

a descrambler for performing predetermined

descrambling on the signal from said frame synchronization unit and outputting the resulting signal as a descrambled signal;

a first overhead extraction unit for extracting and/or terminating predetermined overhead information for OAM&P of a network inserted in a predetermined overhead area of the descrambled signal from said descrambler, and outputting the descrambled signal from which the predetermined overhead information is extracted and/or in which the predetermined overhead information is terminated;

a first decode processor unit for decoding the signal from said first overhead extraction unit using an inner code Ψ and outputting the decoded signal as an inner decoded signal;

a second overhead extraction unit for extracting and/or terminating predetermined overhead information for OAM&P of a network inserted in a predetermined overhead area of the inner decoded signal from said first decode processor unit, and outputting the inner decoded signal from which the predetermined overhead information is extracted and/or in which the predetermined overhead information is terminated;

a first frame conversion unit for reducing a bit rate of the signal from said second overhead extraction unit to a predetermined bit rate, converting the number of parallellized data of the signal to a predetermined number of parallellized data to rearrange

the data into a predetermined frame format, and outputting the rearranged data;

a second decode processor unit for decoding the signal from said first frame conversion unit using an outer code Λ and outputting the decoded signal as an outer decode signal;

a third overhead extraction unit for extracting and/or terminating predetermined overhead information for OAM&P of a network inserted in a predetermined overhead area of the outer decode signal from said second decode processor unit, and outputting the outer decode signal from which the predetermined overhead information is extracted and/or in which the predetermined overhead information is terminated;

a second frame conversion unit for reducing a bit rate of the signal from said third overhead extraction unit to a predetermined bit rate, rearranging data into a predetermined frame format, and outputting the rearranged data;

a parallel-to-serial conversion unit for serializing the signal from said second frame conversion unit, and outputting the serialized signal as a digital client signal having a constant bit rate;

an overhead processor unit for processing predetermined information for OAM&P of a network which is extracted and/or terminated in said first overhead insertion unit, said second overhead insertion unit and said third overhead insertion unit; and

an FEC performance monitor unit for processing information on the number of corrected data in the decoding performed in said first decode processor unit and said second decode processor unit, an estimated value for the number of uncorrectable bits when uncorrectable errors exist, and the number of error corrected bits when errors are corrected.

42. A transmitting apparatus for converting a client signal into a super FEC signal and vice versa, and directly regenerating said super FEC signal, said transmitting apparatus comprising:

an opto-electric conversion unit for receiving a first optical signal from an external optical transmission path, converting the first optical signal into an electric signal, and outputting the electric signal;

the super FEC signal receiver according to claim 26 for receiving the electric signal from said opto-electric conversion unit as a first super FEC signal, converting the electric signal into a first client signal, and outputting the first client signal;

a branch unit for branching the first client signal from said super FEC signal receiver, transmitting one of the branched signals to an external transmission path, and reversing the other one to generate a reverse signal;

the super FEC signal transmitter according to claim 25 for receiving a second client signal from an

external transmission path or the reverse signal branched off at said branch unit, converting the received signal into a second super FEC signal, and outputting the second supper FEC signal; and

an electro-optical conversion unit for converting the second super FEC signal from said super FEC signal transmitter into a second optical signal, and transmitting the second optical signal to an external optical transmission path.

43. A transmitting apparatus for performing multiplexing, demultiplexing and cross-connecting between a plurality of subclient signals and a client signal, and a conversion between the client signal and a super FEC signal, and direct regeneration of said super FEC signal, said transmitting apparatus comprising:

an opto-electric conversion unit for receiving a first optical signal from an external optical transmission path, converting the first optical signal into an electric signal, and outputting the electric signal;

the super FEC signal receiver according to claim 26 for receiving the electric signal from said opto-electric conversion unit as a first super FEC signal, converting the first super FEC signal into a first client signal, and outputting the first client signal;

a branch unit for branching the first client

signal from said super FEC signal receiver, outputting one of the branched signals as a forward signal, and outputting the other of the branched signals as a reverse signal;

a demultiplexing unit for receiving the forward signal from said branch unit, time division demultiplexing the forward signal, and outputting a plurality of first intermediate client signals;

a cross-connect switch unit for receiving a plurality of first subclient signals from a plurality of external transmission paths, receiving the plurality of first intermediate client signals from said demultiplexing unit, and performing cross-connect switching the received signals to output a plurality of second subclient signals and a plurality of second intermediate client signals, wherein the plurality of second subclient signals are transmitted to a plurality of external transmission paths;

a multiplexing unit for receiving the second intermediate client signals from said cross-connect switch unit, time division multiplexing the second intermediate client signals, and outputting the multiplexed second intermediate client signals as a second client signal;

the super FEC signal transmitter according to claim 25 for receiving either the second client signal from said multiplexing unit or the reverse signal branched off at said branch unit, converting the

received signal into a second super FEC signal, and outputting the second super FEC signal; and

an electro-optical conversion unit for converting the second super FEC signal from said super FEC signal transmitter into a second optical signal, and transmitting the second optical signal to an external optical transmission path.

44. A transmitting apparatus for performing a conversion between a plurality of client signals and a plurality of super FEC signals, multiplexing, demultiplexing, cross-connecting and direct regenerating the plurality of super FEC signals, said transmitting apparatus comprising:

a demultiplexing unit for receiving a first optical signal from an external optical transmission path, and demultiplexing the first optical signal into a plurality of second optical signals at each wavelength;

a plurality of the super FEC signal transmitters according to claim 25 for receiving a plurality of first client signals from a plurality of external transmission lines, converting the plurality of first client signals into a plurality of first super FEC signals, and outputting the plurality of first super FEC signals;

a plurality of electro-optical conversion units for converting each of the plurality of first super FEC signals into a plurality of third optical

signals, said third optical signals being different in wavelength from one another;

a cross-connect switch for receiving the plurality of second optical signals and the plurality of third optical signals, and performing cross-connect switching on the received signals to output a plurality of fourth optical signals and a plurality of fifth optical signals;

a plurality of opto-electric conversion units for converting the plurality of fourth optical signals to electric signals, and outputting the electric signals;

a plurality of the super FEC signal receivers according to claim 26 for receiving the electric signals from said plurality of opto-electric conversion units as a plurality of second super FEC signals, converting each of the second super FEC signals into a second client signal, and outputting the second client signals;

a branch unit for branching each of the plurality of second client signals, transmitting one of the branched signals of each of the plurality of second client signals to a plurality of external transmission paths, and reversing the other one of each of the plurality of second client signals to generate a plurality of reverse signals; and

a multiplexing unit for wavelength division multiplexing the plurality of fifth optical signals and

transmitting the multiplexed signal to an external transmission path,

wherein each of said plurality of super FEC signal transmitters is also capable of receiving the plurality of reverse signals branched off at said branch unit instead of said plurality of first client signals, converting the plurality of reverse signals into a plurality of first super FEC signals, and outputting the plurality of first super FEC signals.

45. A network comprising:

a plurality of transmitting apparatus for performing a conversion between one or a plurality of client signals and one or a plurality of super FEC signals;

a plurality of optical fibers interconnecting said plurality of transmitting apparatus for transmitting one or a plurality of super line signals, said one or plurality of super line signals being one or a plurality of optical signals converted from the one or the plurality of super FEC signals; and

a control system for controlling said plurality of transmitting apparatus and executing OAM&P of said network, each of said transmitting apparatus being located on a super line side for transmitting and receiving the super line signals,

each of said transmitting apparatus comprising:

a regenerator type transmitting apparatus for

transmitting and receiving one or a plurality of client signals to and from an external network, converting the received first client signal into a first super FEC signal, and transmitting the first super FEC signal to other said transmitting apparatus in said network, and conversely, converting a second super FEC signal received from another transmitting apparatus in said network into a second client signal, and transmitting the second client signal to said external network; or

a client multiplexing type transmitting apparatus for receiving a plurality of third client signals from an external network, while converting a plurality of third super FEC signals received from another transmitting apparatus in said network into a plurality of fourth client signals, performing cross-connecting, multiplexing and demultiplexing between the third client signals and the fourth client signals to generate a plurality of fifth client signals and a plurality of sixth client signals, and transmitting the fifth client signals to said external network while converting the sixth client signals into a plurality of fourth super FEC signals, and transmitting the plurality of fourth super FEC signals to another transmitting apparatus in said network; or

a super line multiplexing type transmitting apparatus for receiving a plurality of seventh client signals from an external network, and converting the plurality of seventh client signals into a plurality of

fifth super FEC signals, while receiving a plurality of sixth super FEC signals from another transmitting apparatus in said network, performing cross-connecting, multiplexing and demultiplexing between the fifth super FEC signals and the sixth super FEC signals to generate a plurality of seventh super FEC signals and a plurality of eighth super FEC signals, converting the seventh super FEC signals into a plurality of eighth client signals, and transmitting the eighth client signals to said external network, while transmitting the eighth super FEC signal to another transmitting apparatus within said network; or

a transmitting apparatus having a combination of functions of said regenerator type transmitting apparatus, said client multiplexing type transmitting apparatus and said super line multiplexing type transmitting apparatus.